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SLOCUM LAKE, LAKE COUNTY, ILLINOIS

Pacific Northwest Environmental Research Laboratory

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NATIONAL EUTROPHICATION SURVEY

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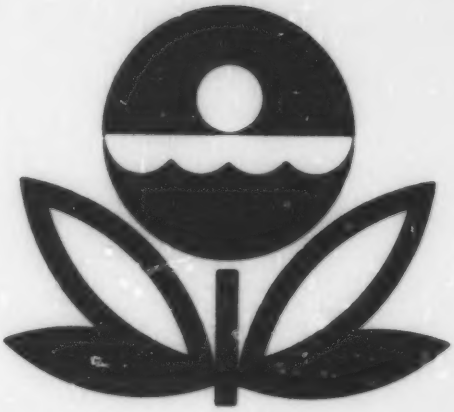

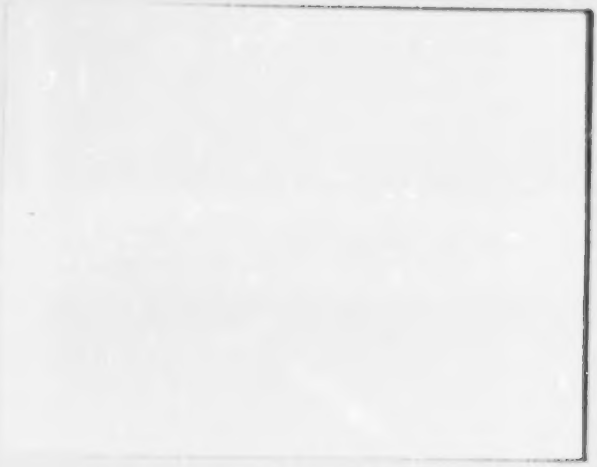

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REPORT
ON
SLOCUM LAKE
LAKE COUNTY
ILLINOIS
EPA REGION V
WORKING PAPER No. 316

WITH THE COOPERATION OF THE
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
AND THE
ILLINOIS NATIONAL GUARD
JUNE, 1975

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16. ABSTRACT
Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivded according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

17. KEY WORDS AND DOCUMENT ANALYSIS

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Illinois Environmental Protection Agency for professional involvement and to the Illinois National Guard for conducting the tributary sampling phase of the Survey.

Dr. Richard H. Briceland, Director of the Illinois Environmental Protection Agency; and Ronald M. Barganz, State Survey Coordinator, and John J. Forneris, Manager of Region III, Field Operations Section of the Division of Water Pollution Control, provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

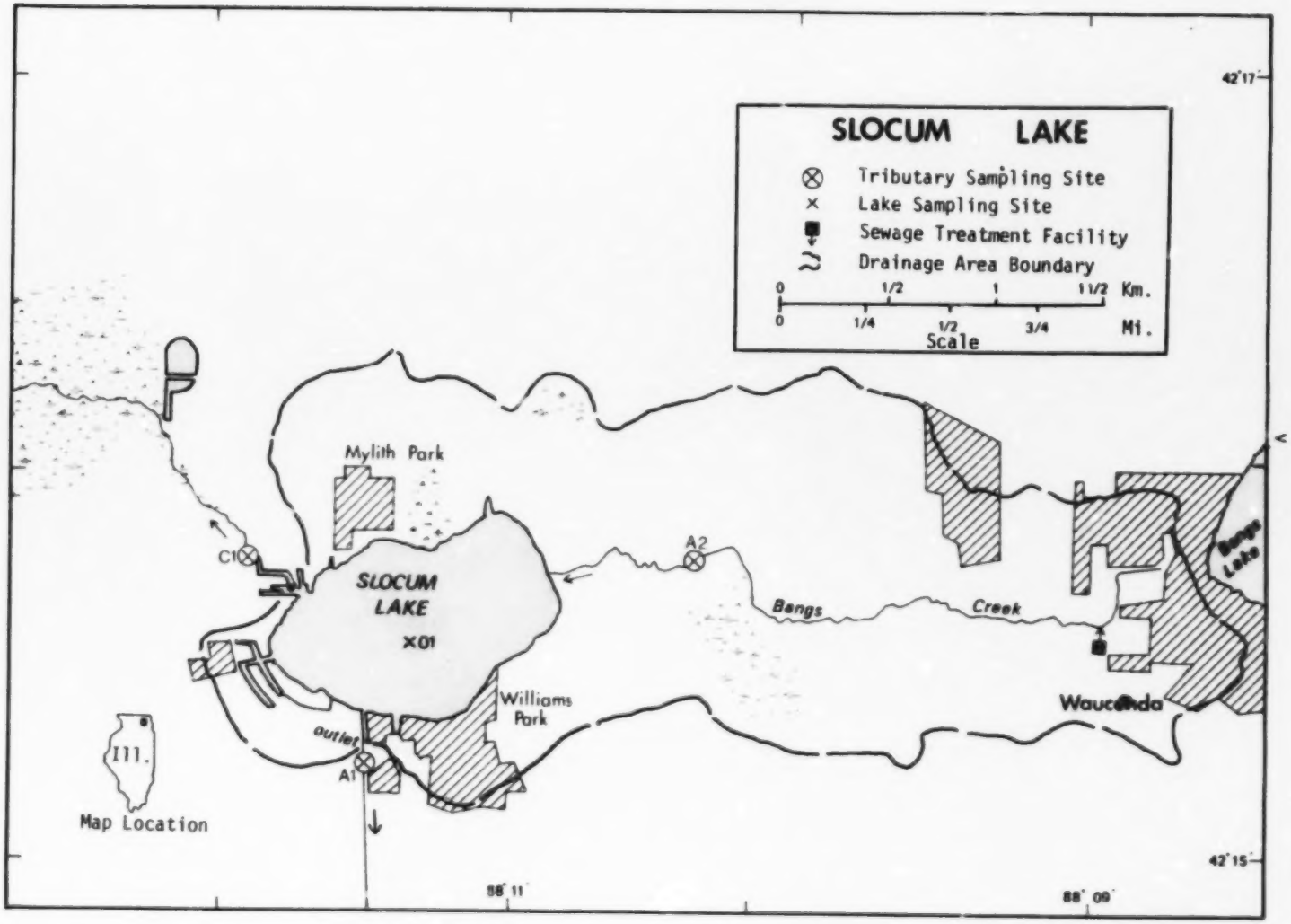
Major General Harold R. Patton, the Adjutant General of Illinois, and Project Officer Colonel Daniel L. Fane, who directed the volunteer efforts of the Illinois National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF ILLINOIS

LAKE NAME	COUNTY
Baldwin	Randolph
Bloomington	McLean
Carlyle	Bond, Clinton, Fayette
Cedar	Lake
Charleston	Coles
Coffeen	Montgomery
Crab Orchard	Jackson, Williamson
Decatur	Macon
DePue	Bureau
East Loon	Lake
Fox	Lake
Grass	Lake
Highland Silver	Madison
Holiday	LaSalle
Horseshoe	Madison
Long	Lake
Lou Yaeger	Montgomery
Marie	Lake
Old Ben Mine	Franklin
Pistakee	Lake, McHenry
Raccoon	Marion
Rend	Franklin, Jefferson
Sangchris	Christian
Shelbyville	Moultrie, Shelby
Slocum	Lake
Springfield	Sangamon
Storey	Knox
Vandalia	Fayette
Vermilion	Vermilion
Wee Ma Tuk	Fulton
Wonder	McHenry


SLOCUM LAKE
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
Drainage Area Boundary
0 1/2 1 1 1/2 Km.
0 1/4 1/2 3/4 Mi.
Scale
42°17'
Mylith Park
C1
SLOCUM LAKE
X01
A2
Bangs Creek
Bangs Lake
Williams Park
Waucanda
outlet
A1
Ill.
Map Location
42°15'
88° 11'
88° 09'

SLOCUM LAKE

STORET NO. 1758

I. CONCLUSIONS

A. Trophic Condition:

Survey data indicate that Slocum Lake is highly eutrophic. It ranked 27th in overall trophic quality when the 31 Illinois lakes sampled in 1973 were compared using a combination of six parameters*. Twenty-nine lakes had less median total phosphorus, 28 had less median dissolved phosphorus, three had less and one had the same median inorganic nitrogen, all of the other lakes had less mean chlorophyll a, and 26 had greater mean Secchi disc transparency.

B. Rate-Limiting Nutrient:

The algal assay results indicate nitrogen limitation. The lake data also indicate nitrogen limitation; i.e., mean N/P ratios were less than 1/1 at all sampling times.

C. Nutrient Controllability:

1. Point sources--The phosphorus contribution from the Wauconda wastewater treatment plant amounted to nearly 53% of the total load reaching Slocum Lake during the sampling year. Shoreline septic tanks were estimated to have contributed 0.2% of the total load.

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* See Appendix A.

The present phosphorus loading rate of 11.18 $g/m^2/yr$ is far greater than that proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic rate (see page 12). On the basis of Survey data, it is very probable that the quality of Slocum Lake will continue to deteriorate if the present loading rate is maintained. Because of the highly eutrophic condition of the lake, all phosphorus inputs should be minimized to the greatest practicable extent.

2. Non-point sources--The phosphorus load from non-point sources accounted for 47.0% of the total load reaching the lake during the sampling year. The only measured tributary, Bangs Creek, contributed 39.5%, and the ungaged drainage area was estimated to have contributed 7.3% of the total phosphorus load.

The phosphorus export rate of Bangs Creek was a high 210 kg/km^2 during the sampling year (see page 12). This high rate and the export N/P ratio of less than 2/1 are indicative of unmeasured point sources or significant urban runoff in the drainage. In this regard, it is noted that the measured phosphorus contribution of the City of Wauconda (to Bangs Creek) was about that expected on a per-capita contribution basis.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS†

A. Lake Morphometry††:

1. Surface area: 0.87 kilometers^2.
2. Mean depth: 1.2 meters.
3. Maximum depth: >1.5 meters.
4. Volume: 1.044 x 10^6 m^3.
5. Mean hydraulic retention time: 121 days.

B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

Name	Drainage area (km^2)*	Mean flow (m^3/sec)*
Bangs Creek	18.3	0.1
Minor tributaries & immediate drainage -	3.4	<0.1
Totals	21.7	0.1

2. Outlet -

Unnamed Stream (A-1)	22.6**	0.1

C. Precipitation***:

1. Year of sampling: 112.3 centimeters.
2. Mean annual: 83.3 centimeters.

---

† Table of metric conversions--Appendix B.
†† Forneris, 1973.
* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".
** Includes area of lake.
*** See Working Paper No. 175.

III. LAKE WATER QUALITY SUMMARY

Slocum Lake was sampled three times during the open-water season of 1973 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from one station on the lake and usually from two depths (see map, page v). During each visit, a single depth-integrated (near bottom to surface) sample was collected for phytoplankton identification and enumeration; and a similar sample was taken for chlorophyll *a* analysis. During the first visit, a single 18.9-liter depth-integrated sample was collected for algal assays. The maximum depth sampled was 1.5 meters.

The lake sampling results are presented in full in Appendix D and are summarized in the following table.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR SLOCUM LAKE
STORET CODE 1758

PARAMETER	1ST SAMPLING (5/ 9/73) 1 SITES RANGE	MEAN	MEDIAN	2ND SAMPLING (8/ 7/73) 1 SITES RANGE	MEAN	MEDIAN	3RD SAMPLING (10/16/73) 1 SITES RANGE	MEAN	MEDIAN
TEMP (C)	14.6 - 14.6	14.6	14.6	25.1 - 25.3	25.2	25.2	16.4 - 16.4	16.4	16.4
DISS OXY (MG/L)	9.2 - 9.2	9.2	9.2	10.2 - 16.8	13.5	13.5	0.0 - 0.0	0.0	0.0
CNDCTVY (MCROMO)	600. - 650.	625.	625.	754. - 755.	755.	755.	622. - 622.	622.	622.
PH (STAND UNITS)	8.6 - 8.8	8.7	8.7	9.3 - 9.4	9.3	9.3	9.2 - 9.2	9.2	9.2
TOT ALK (MG/L)	210. - 214.	212.	212.	288. - 298.	293.	293.	214. - 214.	214.	214.
TOT P (MG/L)	0.490 - 0.512	0.501	0.501	0.865 - 0.900	0.882	0.882	1.330 - 1.330	1.330	1.330
ORTHO P (MG/L)	0.271 - 0.276	0.273	0.273	0.362 - 0.409	0.385	0.385	0.848 - 0.848	0.848	0.848
NO2+NO3 (MG/L)	0.120 - 0.130	0.125	0.125	0.150 - 0.200	0.175	0.175	0.040 - 0.040	0.040	0.040
AMMONIA (MG/L)	0.070 - 0.080	0.075	0.075	0.120 - 0.180	0.150	0.150	0.060 - 0.060	0.060	0.060
KJEL N (MG/L)	1.900 - 2.100	2.000	2.000	6.100 - 6.400	6.250	6.250	6.000 - 6.000	6.000	6.000
INORG N (MG/L)	0.200 - 0.200	0.200	0.200	0.270 - 0.380	0.325	0.325	0.100 - 0.100	0.100	0.100
TOTAL N (MG/L)	2.030 - 2.220	2.125	2.125	6.250 - 6.600	6.425	6.425	6.040 - 6.040	6.040	6.040
CHLRPYL A (UG/L)	109.9 - 109.9	109.9	109.9	312.0 - 312.0	312.0	312.0	241.4 - 241.4	241.4	241.4
SECCHI (METERS)	0.5 - 0.5	0.5	0.5	0.2 - 0.2	0.2	0.2	0.3 - 0.3	0.3	0.3

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal units per ml
05/09/73	1. Cyclotella sp.	13,153
	2. Melosira sp.	2,162
	3. Scenedesmus sp.	1,802
	4. Anabaena sp.	1,622
	5. Cryptomonas sp.	1,441
	Other genera	2,883
	Total	23,063
08/07/73	1. Aphanizomenon sp.	28,338
	2. Melosira sp.	1,449
	3. Stephanodiscus sp.	378
	4. Cyclotella sp.	315
	5. Microcystis sp.	189
	Other genera	1,258
	Total	31,927
10/16/73	1. Aphanizomenon sp.	17,189
	2. Melosira sp.	1,084
	3. Cyclotella sp.	271
	4. Closterium sp.	232
	5. Synedra sp.	116
	Other genera	194
	Total	19,086

2. Chlorophyll a -

Sampling Date	Station Number	Chlorophyll a (µg/l)
05/09/73	01	109.9
08/07/73	01	312.0
10/16/73	01	241.4

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.145	0.610	20.7
0.050 P	0.195	0.610	20.1
0.050 P + 1.0 N	0.195	1.610	50.5
1.0 N	0.145	1.610	44.4

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential primary productivity of Slocum Lake was high at the time the sample was collected. There was a significant increase in yield when only nitrogen was added, but there was no change in yield when orthophosphorus alone was added. These results indicate nitrogen limitation.

The lake data also indicate nitrogen limitation; i.e., the mean inorganic nitrogen/orthophosphorus ratios were less than 1/1 at all sampling times, and nitrogen limitation would be expected.

IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the Illinois National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff month of March when two samples were collected. Sampling was begun in June, 1973, and was completed in May, 1974.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Illinois District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings* (the outlet flow at station C-1 was insignificant, and loadings were not calculated). Nutrient loads shown are those measured minus point-source loads, if any.

Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the adjusted nutrient loads, in $kg/km^2/year$, at station A-2 and multiplying by the ZZ area in km^2.

The operator of the Wauconda wastewater treatment plant provided monthly effluent samples and corresponding flow data.

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* See Working Paper No. 175.

A. Waste Sources:

1. Known municipal* -

Name	Pop. Served	Treatment	Mean Flow (m^3/d)	Receiving Water
Wauconda	6,000	trickling filter	2,547.6	Bangs Creek

2. Known industrial - None

* Kuester, 1973.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/ yr	% of total
a. Tributaries (non-point load) -		
Bangs Creek	3,850	39.5
b. Minor tributaries & immediate drainage (non-point load) -	715	7.3
c. Known municipal STP's -		
Wauconda	5,135	52.8
d. Septic tanks* -	15	0.2
e. Known industrial - None	-	-
f. Direct precipitation** -	15	0.2
Total	9,730	100.0

2. Outputs -

Lake outlet - Unnamed Stream (A-1)	3,915

3. Net annual P accumulation - 5,815 kg.

* Estimate based on 45 shoreline dwellings; see Working Paper No. 175.
** See Working Paper No. 175.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/yr	% of total
a. Tributaries (non-point load) -		
Bangs Creek	7,090	25.7
b. Minor tributaries & immediate drainage (non-point load) -	1,315	4.8
c. Known municipal STP's -		
Wauconda	17,810	64.4
d. Septic tanks* -	480	1.7
e. Known industrial - None	-	-
f. Direct precipitation** -	940	3.4
Total	27,635	100.0

2. Outputs -

Lake outlet - Unnamed Stream (A-1) 18,585

3. Net annual N accumulation - 9,050 kg.

* Estimate based on 45 shoreline dwellings; see Working Paper No. 175.
** See Working Paper No. 175.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	kg P/km²/yr	kg N/km²/yr	N/P Ratio
Bangs Creek	210	387	<2/1

E. Yearly Loading Rates:

In the following table, the existing phosphorus loading rates are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" rate is the rate at which the receiving water would become eutrophic or remain eutrophic; his "permissible" rate is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic rate would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m²/yr	11.18	6.68	31.8	10.4

Vollenweider loading rates for phosphorus (g/m²/yr) based on mean depth and mean hydraulic retention time of Slocum Lake:

"Dangerous" (eutrophic rate)	0.38
"Permissible" (oligotrophic rate)	0.19

V. LITERATURE REVIEWED

Forneris, John J., 1973. Personal communication (lake morphometry). IL Env. Prot. Agency, Springfield.

Kuester, Jeff (Chief Operator), 1973. Treatment plant questionnaire (Wauconda STP). Wauconda.

Vollenweider, R. A., and P. J. Dillon, 1974. The application of the phosphorus loading concept to eutrophication research. Natl. Res. Council of Canada Publ. No. 13690, Canada Centre for Inland Waters, Burlington, Ontario.

VI. APPENDICES

APPENDIX A

LAKE RANKINGS

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500- MEAN SEC	MEAN CHLORA	15- MIN DO	MEDIAN DISS ORTHO P
1703	LAKE BLOOMINGTON	0.050	5.730	464.667	26.200	14.800	0.020
1706	LAKE CARLYLE	0.084	1.270	477.889	17.367	11.000	0.032
1708	LAKE CHARLESTON	0.160	4.680	490.667	12.000	8.400	0.065
1711	COFFEEN LAKE	0.032	0.260	456.222	7.700	14.400	0.012
1712	CRAB ORCHARD LAKE	0.082	0.200	482.222	59.867	13.800	0.013
1714	LAKE DECATUR	0.124	3.750	474.571	43.000	14.500	0.062
1725	LONG LAKE	0.704	1.140	482.667	49.333	8.800	0.395
1726	LAKE LOU YAEGER	0.106	1.600	489.583	10.662	11.400	0.076
1727	LAKE MARIE	0.098	0.370	467.667	34.533	14.700	0.057
1733	PISTAKEE LAKE	0.203	0.370	485.667	75.867	7.000	0.062
1735	RENO LAKE	0.071	0.210	471.500	23.533	12.700	0.012
1739	LAKE SHELBYVILLE	0.062	3.290	461.333	17.161	14.800	0.014
1740	SILVER LAKE (HIGHLAND)	0.226	0.970	484.500	5.822	14.800	0.057
1742	LAKE SPRINGFIELD	0.104	3.265	483.385	13.013	10.800	0.059
1748	VERMILION LAKE	0.109	4.645	481.500	31.150	14.200	0.050
1750	WONDER LAKE	0.426	0.890	486.000	98.533	7.800	0.132
1751	LAKE STORY	0.072	2.510	459.333	17.250	14.800	0.021
1752	DEPUE LAKE	0.438	4.050	490.000	58.833	7.600	0.276
1753	LAKE SANGCHRIS	0.050	1.970	475.417	19.242	14.500	0.009
1754	LAKE HOLIDAY	0.167	3.135	485.167	51.217	7.200	0.048
1755	FOX LAKE	0.214	0.375	486.167	63.850	8.800	0.083
1756	GRASS LAKE	0.301	0.820	481.000	83.500	5.400	0.093
1757	EAST LOON LAKE	0.078	0.120	450.000	22.300	14.400	0.018
1758	SLOCUM LAKE	0.865	0.200	487.333	221.100	5.800	0.362
1759	CEDAR LAKE	0.024	0.170	400.333	5.767	12.800	0.013
1761	LAKE MATTOON	0.053	1.770	466.333	7.967	14.500	0.031
1762	RACCOON LAKE	0.130	0.310	484.333	19.217	13.800	0.020
1763	BALDWIN LAKE	0.044	0.140	451.167	11.333	13.200	0.007

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500- MEAN SEC	MEAN CHLORA	15- MIN DO	MEDIAN DISS ORTHO P
1764	LAKE VANDALIA	0.116	0.480	478.111	11.276	14.600	0.023
1765	OLD BEN MINE RESERVOIR	0.930	0.205	478.333	31.433	11.200	0.575
1766	HORSESHOE LAKE	0.127	0.705	482.833	182.250	6.600	0.018

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
1703	LAKE BLOOMINGTON	88 (26)	0 (0)	80 (24)	47 (14)	13 (2)	68 (20)	296
1706	LAKE CARLYLE	63 (19)	40 (12)	63 (19)	63 (19)	63 (19)	53 (16)	345
1708	LAKE CHARLESTON	37 (11)	7 (2)	0 (0)	77 (23)	77 (23)	27 (8)	225
1711	COFFEEN LAKE	97 (29)	77 (23)	93 (28)	93 (28)	2 (0)	92 (27)	454
1712	CRAB ORCHARD LAKE	67 (20)	90 (27)	43 (13)	20 (6)	42 (12)	85 (25)	347
1714	LAKE DECATUR	40 (12)	13 (4)	53 (16)	33 (10)	30 (8)	32 (9)	201
1725	LONG LAKE	7 (2)	43 (13)	40 (12)	30 (9)	72 (21)	3 (1)	195
1726	LAKE LOU YAEGER	30 (9)	37 (11)	7 (2)	87 (26)	57 (17)	23 (7)	241
1727	LAKE MARIE	60 (18)	68 (20)	73 (22)	37 (11)	23 (7)	42 (12)	303
1733	PISTAKEE LAKE	27 (8)	68 (20)	23 (7)	13 (4)	90 (27)	32 (9)	253
1735	REND LAKE	77 (23)	80 (24)	70 (21)	50 (15)	53 (16)	92 (27)	422
1739	LAKE SHELBYVILLE	83 (25)	17 (5)	83 (25)	70 (21)	13 (2)	73 (22)	339
1740	SILVER LAKE (HIGHLAND)	20 (6)	47 (14)	10 (3)	97 (29)	13 (2)	42 (12)	229
1742	LAKE SPRINGFIELD	53 (16)	20 (6)	33 (10)	73 (22)	67 (20)	37 (11)	283
1748	VERMILION LAKE	50 (15)	3 (1)	47 (14)	43 (13)	37 (11)	47 (14)	227
1750	WONDER LAKE	13 (4)	50 (15)	20 (6)	7 (2)	80 (24)	13 (4)	183
1751	LAKE STORY	73 (22)	27 (8)	90 (27)	67 (20)	13 (2)	63 (19)	333
1752	DEPUE LAKE	10 (3)	10 (3)	3 (1)	23 (7)	83 (25)	10 (3)	139
1753	LAKE SANGCHRIS	88 (26)	30 (9)	67 (20)	57 (17)	30 (8)	97 (29)	369
1754	LAKE HOLIDAY	33 (10)	23 (7)	27 (8)	27 (8)	87 (26)	50 (15)	247
1755	FOX LAKE	23 (7)	63 (19)	17 (5)	17 (5)	72 (21)	20 (6)	212
1756	GRASS LAKE	17 (5)	53 (16)	50 (15)	10 (3)	97 (29)	17 (5)	244
1757	EAST LOON LAKE	70 (21)	100 (30)	97 (29)	53 (16)	2 (0)	77 (23)	349
1758	SLOCUM LAKE	3 (1)	87 (26)	13 (4)	0 (0)	100 (30)	7 (2)	210
1759	CEDAR LAKE	100 (30)	93 (28)	100 (30)	100 (30)	50 (15)	85 (25)	528
1761	LAKE WEMATUK	80 (24)	33 (10)	77 (23)	90 (27)	30 (8)	57 (17)	367
1762	RACCOON LAKE	57 (17)	73 (22)	30 (9)	60 (18)	42 (12)	68 (20)	330
1763	BALDWIN LAKE	93 (28)	97 (29)	87 (26)	80 (24)	47 (14)	100 (30)	504

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
1764	LAKE VANDALIA	47 (14)	60 (18)	60 (18)	83 (25)	13 (2)	60 (18)	323
1765	OLD BEN MINE RESERVOIR	0 (0)	83 (25)	57 (17)	40 (12)	60 (18)	0 (0)	240
1766	HORSESHOE LAKE	43 (13)	57 (17)	37 (11)	3 (1)	93 (28)	80 (24)	313

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	1759	CEDAR LAKE	528
2	1763	BALDWIN LAKE	504
3	1711	COFFEEN LAKE	454
4	1735	REND LAKE	422
5	1757	EAST LOON LAKE	399
6	1753	LAKE SANGCHRIS	369
7	1761	LAKE WEMATUK	367
8	1712	CRAB ORCHARD LAKE	347
9	1706	LAKE CARLYLE	345
10	1739	LAKE SHELBYVILLE	339
11	1751	LAKE STORY	333
12	1762	RACCOON LAKE	330
13	1764	LAKE VANDALIA	323
14	1766	HORSESHOE LAKE	313
15	1727	LAKE MARIE	303
16	1703	LAKE BLOOMINGTON	296
17	1742	LAKE SPRINGFIELD	283
18	1733	PISTAKEE LAKE	253
19	1754	LAKE HOLIDAY	247
20	1756	GRASS LAKE	244
21	1726	LAKE LOU YAEGER	241
22	1765	OLD BEN MINE RESERVOIR	240
23	1740	SILVER LAKE (HIGHLAND)	229
24	1748	VERMILION LAKE	227
25	1704	LAKE CHARLESTON	225
26	1755	FOX LAKE	212
27	1758	SLOCUM LAKE	213
28	1719	LAKE DECATUR	207

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
29	1725	LONG LAKE	195
30	1750	WONDER LAKE	183
31	1752	DEPUE LAKE	139

Appendix B

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR ILLINOIS 10/23/75

LAKE CODE 1758 SLOCUM LAKE

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 22.6

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1758A1	22.6	0.14	0.22	0.27	0.27	0.21	0.18	0.11	0.05	0.04	0.04	0.06	0.07	0.14
1758A2	18.3	0.11	0.18	0.21	0.22	0.17	0.15	0.09	0.04	0.03	0.03	0.05	0.06	0.11
1758ZZ	4.3	0.03	0.04	0.05	0.05	0.04	0.04	0.02	0.01	0.01	0.01	0.01	0.01	0.03

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 22.6
SUM OF SUB-DRAINAGE AREAS = 22.6

TOTAL FLOW IN = 1.66
TOTAL FLOW OUT = 1.66

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
1758A1	6	73	0.25	3	0.28				
	7	73	0.10	7	0.26				
	8	73	0.04	4	0.03				
	9	73	0.07	8	0.03				
	10	73	0.13	13	0.42				
	11	73	0.12	3	0.13				
	12	73	0.25	2	0.08				
	1	74	0.28	5	0.08				
	2	74	0.37	2	0.68	23	1.02		
	3	74	0.40	9	0.85	16	0.45		
	4	74	0.45	7	0.31				
	5	74	0.68	18	1.27				
1758A2	6	73	0.20	3	0.23				
	7	73	0.08	7	0.20				
	8	73	0.03	4	0.03				
	9	73	0.06	8	0.02				
	10	73	0.10	13	0.34				
	11	73	0.09	3	0.10				
	12	73	0.20	2	0.07				
	1	74	0.23	5	0.07				
	2	74	0.27	2	0.54	23	0.82		
	3	74	0.31	9	0.68	16	0.37		
	4	74	0.37	7	0.25				
	5	74	0.54	18	1.02				
1758ZZ	6	73	0.05	3	0.05				
	7	73	0.02	7	0.05				
	8	73	0.01	4	0.01				
	9	73	0.01	8	0.01				
	10	73	0.03	13	0.08				
	11	73	0.03	3	0.03				
	12	73	0.05	2	0.02				
	1	74	0.05	5	0.02				
	2	74	0.09	2	0.14	23	0.20		
	3	74	0.08	9	0.17	16	0.08		
	4	74	0.08	7	0.06				
	5	74	0.14	18	0.25				

APPENDIX D

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 75/10/23

175801
42 15 34.0 088 11 20.0
SLOCUM LAKE
17097 ILLINOIS

11EPALES
3

2111202
0008 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/05/09	11 25	0000	14.6		18	650	8.80	210	0.070	1.900	0.130	0.276
	11 25	0005	14.6	9.2		600	8.60	214	0.080	2.100	0.120	0.271
73/08/07	11 15	0000	25.3	10.2	8	755	9.40	288	0.120	6.100	0.150	0.409
	11 15	0004	25.1	16.8		754	9.30	298	0.180	6.400	0.200	0.362
73/10/16	15 55	0000	16.4	0.0	12	622	9.20	214	0.060	6.000	0.040	0.848

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/05/09	11 25	0000	0.490	109.9
	11 25	0005	0.512	
73/08/07	11 15	0000	0.865	312.0
	11 15	0004	0.900	
73/10/16	15 55	0000	1.330	241.4

APPENDIX E

TRIBUTARY and WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 75/10/23

1758A1
42 15 15.0 088 11 30.0
UNNAMED STREAM
17097 7.5 WAUCONDA
O/SLOCUM LAKE
BRDG IN W EDGE OF VILLAGE WILLIAM PARK
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/06/03	15	15	0.026	3.800	0.168	0.260	0.470
73/07/07	11	15	0.010K	4.000	0.032	0.450	0.790
73/08/04	11	55	0.042	7.100	0.098	0.550	0.810
73/09/08	14	10	0.010K	5.900	0.052	0.570	0.975
73/10/13	11	50	0.027	6.400	0.036	0.870	1.300
73/11/03	12	10	0.090	6.250	0.390		1.450
73/12/02	14	00	0.380	3.150	0.810	1.300	1.500
74/02/02	11	45	0.980	1.700	0.635	0.575	0.650
74/03/09	12	45	0.400	3.100	0.748	0.555	0.810
74/03/16	11	00	0.200	3.300		0.290	0.650
74/04/07	13	55	0.016	2.800	0.840	0.400	0.560
74/05/18	11	30	0.280	2.300	0.045	0.200	0.425

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/10/23

1758A2
42 15 46.0 088 10 20.0
UNNAMED STREAM
17 7.5 WAUCONDA
I/SLOCUM LAKE
ST HWY 176 BRDG E OF LK SLOCUM .4 MI
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/06/03	15 00		1.370	6.300	1.500	0.720	1.150
73/07/07	11 05		2.600	10.500	6.000	5.000	5.000
73/08/04	11 45		3.000	11.000	7.100	8.900	9.400
73/09/08	14 00		9.500	16.000	14.800	8.800	9.200
73/10/13	11 35		1.500	2.600	0.590	0.820	1.100
73/11/03	12 06		2.800	2.200	0.460	1.370	1.650
73/12/02	13 30		2.520	3.700	0.560	1.260	1.300
74/01/05	10 20		2.000	3.650	1.040	0.990	1.160
74/02/02	12 10		0.756	1.150	0.200	0.160	0.200
74/03/09	12 40		0.800	1.900	0.350	0.210	0.360
74/03/16	10 55		0.588	1.600	0.310	0.270	0.345
74/04/07	13 45		1.180	2.700	1.050	0.690	0.810
74/05/18	10 40		0.528	1.900	0.400	0.175	0.370

STORET RETRIEVAL DATE 75/10/23

1758C1
42 15 50.0 088 11 58.0
UNAMED STREAM
17 7.5 WAUCONDA
T/SLOCUM LAKE
LAMPHERE RD CULVERT W EDGE MYLETH PARK
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/06/03	16 00		1.050	3.780	0.115	0.102	0.160
73/07/01	11 25		0.013	6.000	0.125	0.530	0.780
73/08/04	12 10		0.038	7.500	0.131	0.310	0.720
73/09/08	14 20		0.018	7.300	0.176	0.370	0.710
73/10/13	12 00		0.042	6.200	1.000	0.450	0.800
73/11/03	12 20		0.280	4.100	1.300	0.315	0.430
73/12/02	15 00		1.200	1.800	0.500	0.485	0.550
74/01/05	09 50		3.600	1.400	0.062	0.074	0.280
74/02/02	10 55		2.100	0.400	0.045	0.080	0.080
74/03/09	12 55		1.520	0.900	0.040	0.070	0.220
74/03/16	11 10		0.940	1.500	0.060	0.035	0.060
74/04/07	12 10		0.980	2.700	0.345	0.115	0.300

STORET RETRIEVAL DATE 75/10/23

1758AA TF1758AA P006000
42 15 35.0 088 08 50.0
WACONDA
17097 7.5 WAUCONDA
T/SLOCUM LAKE
BANGS CREEK
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/09/07	07 30								
CP(T)-			8.300	20.000		5.200	6.500	0.550	0.500
73/09/07	15 30								
73/10/12	08 00								
CP(T)-			8.900	9.200	0.180	2.800	6.200	0.400	0.500
73/10/12	16 00								
73/11/30	15 30		7.800	14.500	2.000	2.800	4.800	0.800	0.700
74/01/23	16 00		4.500	16.500	0.480	1.600	2.200	1.000	0.800
74/02/19	08 00								
CP(T)-			1.160	15.000	3.500	3.600	5.300	1.200	0.600
74/02/19	15 30								
74/04/29	08 00								
CP(T)-			0.880	20.000	4.550	4.100	7.400	1.000	0.800
74/04/29	15 00								
74/05/20	08 00								
CP(T)-			1.090	11.000	0.035	3.500	5.300	1.000	0.830
74/05/20	15 30								
74/07/01	07 30								
CP(T)-			2.400	17.000	5.600	5.100	6.800	0.800	0.850
74/07/01	15 00								
74/07/24	07 30								
CP(T)-			4.000	8.500	0.305	4.950	5.900	0.600	0.600
74/07/24	15 30								
74/08/30	11 15		0.320	27.000	0.500	0.600	6.500	0.450	0.550